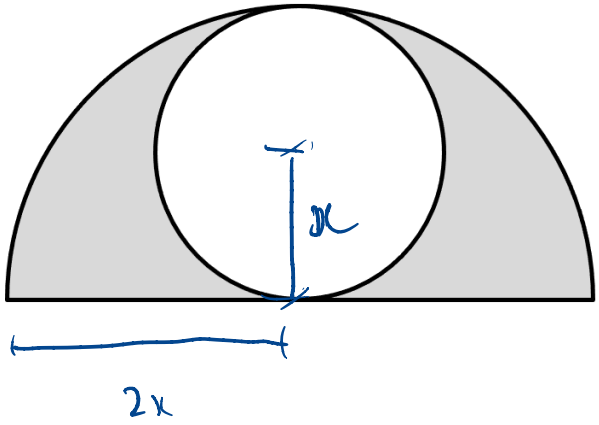
Shape and Space III (2) Sectors and Arcs

Do now:

which has the greater area?

shaded or unshaded?



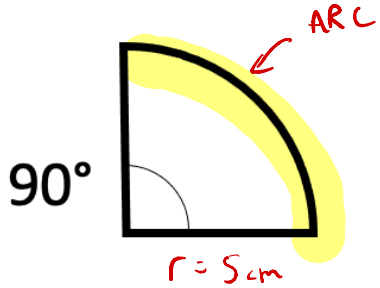
UNSHADED $= x^2\pi$

SHADED $= \frac{1}{2}(2x)^2\pi - x^2\pi$

$= \pi x^2$

SHADED = UNSHADED

How could we calculate the areas and the perimeters of the shapes below?



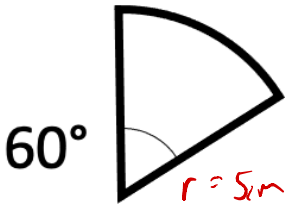
AREA $= \frac{\theta}{360}\pi r^2$

$= \frac{90}{360}\pi(5^2)$

$= \frac{25}{4}\pi \text{ cm}^2$

PERIMETER $= \frac{\theta}{360}(2\pi r) + 2r$

$= \left(\frac{5}{2}\pi + 10\right) \text{cm}$

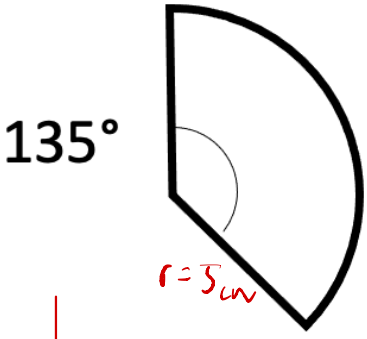


$A = \frac{60}{360}(\pi 5^2)$

$= \frac{25}{6}\pi \text{ cm}^2$

$P = \frac{60}{360}(2\pi(5)) + 10$

$= \left(\frac{5}{3}\pi + 10\right) \text{cm}$



$A = \frac{135}{360}\pi(5^2)$

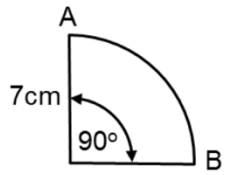
$= \frac{75}{8}\pi \text{ cm}^2$

$P = \frac{135}{360}(2\pi(5)) + 10$

$= \left(\frac{15}{4}\pi + 10\right) \text{cm}$

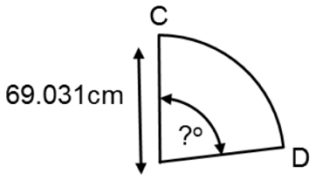
lengths of arcs (i)

(1)



what is the length of arc AB ?

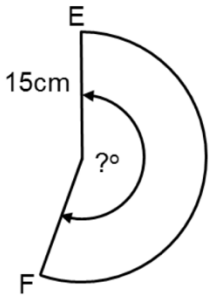
(2)



the length of the arc CD is 100cm

what is the angle?

(3)



the arc EF is to have an length of 50cm

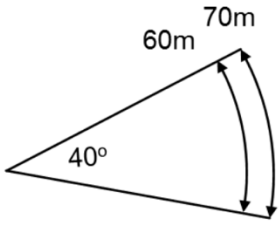
what is the angle?

(4) the radius of the London Eye is 60m

there are 32 equally spaced capsules

how far is it between two adjacent capsules?

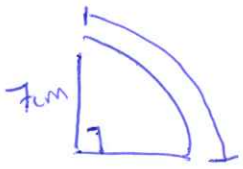
(5)



in a 40° (college) discus throwing area

what is the difference in arc lengths for the 60m and 70m arcs?

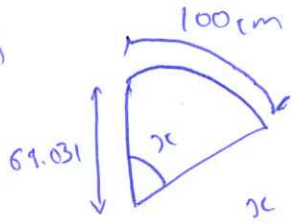
(1)



$\frac{90}{360} \times \pi \times 14 = \frac{7}{2}\pi$ cm

$= 11$cm

(2)

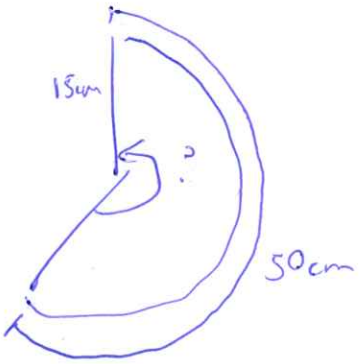


$\frac{x}{360} \times \pi \times 2 \times 69.031 = 100$

$1.2x = 100$

$x = 83°$

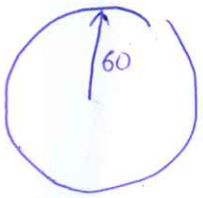
(3)



$\frac{x}{360} \times \pi \times 30 = 50$cm

$x = 191°$

(4)



CIRCUMFERENCE $= 120\pi$

$120\pi \div 32 = \frac{15}{4}\pi$

≈ 11.8m

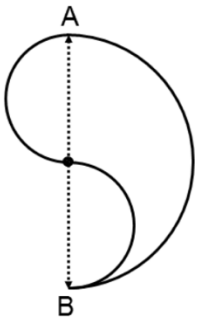
(5) A $\frac{40}{360} \times 120\pi = \frac{40}{3}\pi$

B $\frac{40}{360} \times 140\pi = \frac{140}{9}\pi$

DIFFERENCE B - A $= 7$m

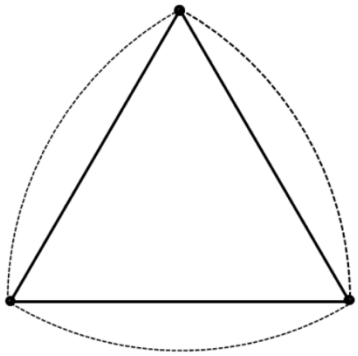
lengths of arcs (ii)

(1)



what is the perimeter of the shape if AB is a diameter of the larger circle, of length 20cm?

(2)

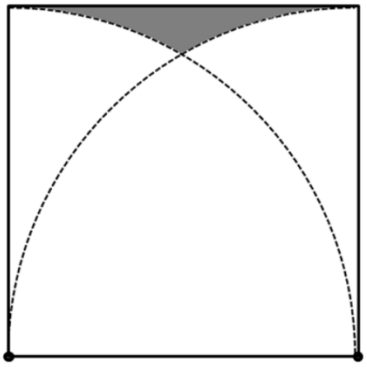


the length of a side of the equilateral triangle is 8cm

what is the total distance around the three arcs (drawn with centres on the corners of the triangle)?

triangle)?

(3)

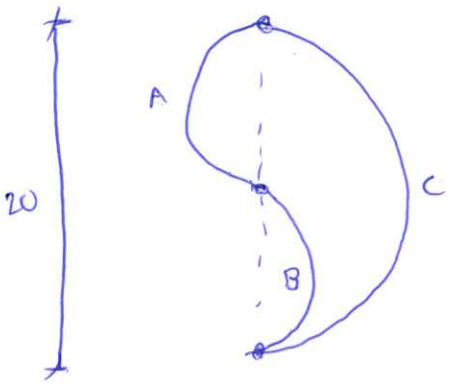


what is the perimeter of the shaded shape if the square has a length of 4cm?

the arcs are drawn with centres on the corners of the square

LENGTHS OF ARCS (ii)

(1)



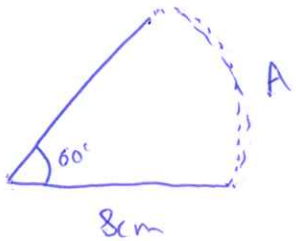
$A + B = 10\pi$

$C = 10\pi$

PERIMETER $= 20\pi$

$= 62.8$ cm

(2)

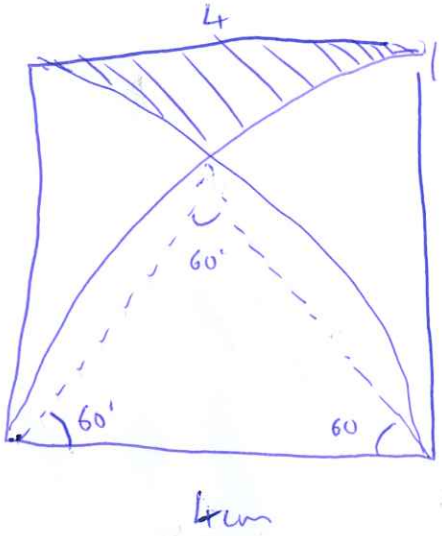


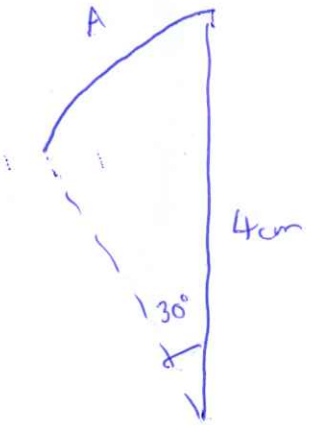
$A = \frac{60}{360} \times 16\pi = \frac{8}{3}\pi$

THERE ARE 3 SO $\frac{8}{3}\pi \times 3 = 8\pi$

$= 25.1$ cm

(3)

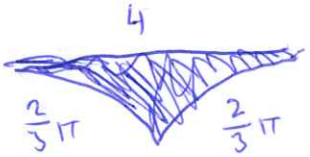




$A = \frac{30}{360} \times 8\pi$

$A = \frac{2}{3}\pi$

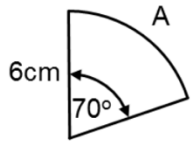
PERIMETER



$= 8.2$cm

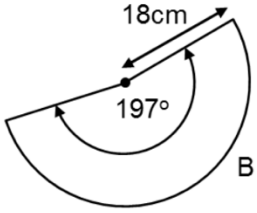
areas of sectors (i)

(1)



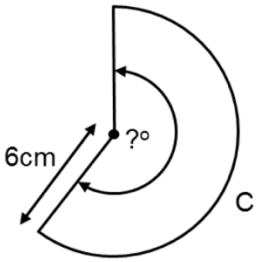
what is the area of sector A ?

(2)



what is the area of sector B ?

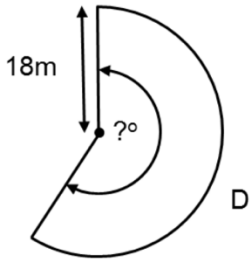
(3)



sector C is to have an area of $60.004cm^2$

what angle must sector C have?

(4)



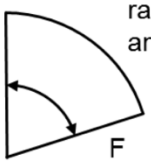
sector D is to have an area of $639m^2$

what angle must sector D have?

(5) which sector (E or F) has a bigger area?

you need to show your calculations to justify your answer

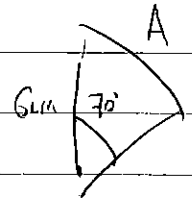
radius = 23cm
angle = 305°



radius = 46cm
angle = 76°

Area of sectors (1)

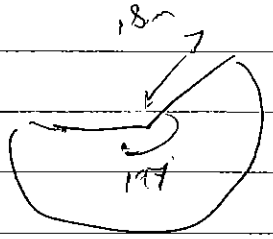
(1)



$\frac{70}{360} \times \pi \times 6^2$

$= \frac{7\pi}{} = 22 cm^2$

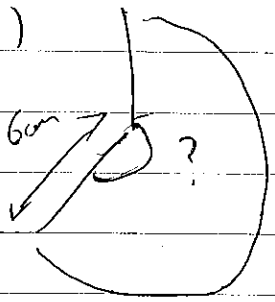
(2)



$\frac{197}{360} \times \pi \times 18^2 = 557 cm^2$

AREA = 60.004 cm^2

(3)

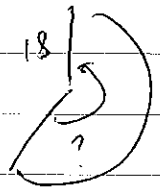


$\frac{\theta}{360} \times \pi \times 6^2 = 60.004$

$\theta = \frac{60.004 \times 360}{\pi \times 6^2}$

$\theta = 191°$

(4)



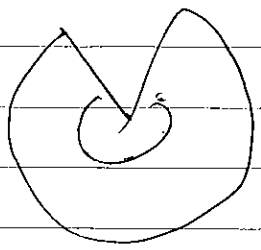
AREA = 639 m^2

$\frac{\theta}{360} \times \pi \times 18^2 = 639$

$\theta = \frac{639 \times 360}{\pi \times 18^2}$

$\theta = 226°$

(5)

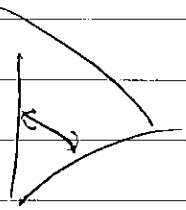


$r = 23$

$\theta = 305$

AREA = $\frac{305}{360} \times \pi \times 23^2$

$= 1408 cm^2$



$r = 46cm$

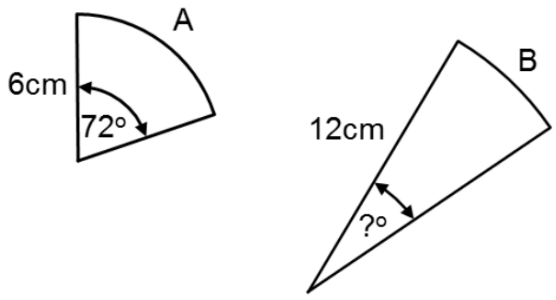
$\theta = 76°$

AREA = $\frac{76}{360} \times \pi \times 46^2$

$= 1403 cm^2$

areas of sectors (ii)

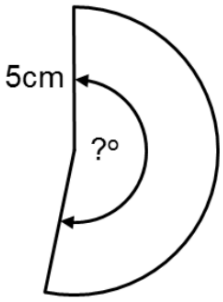
(1)



the two sectors A and B are to have exactly the same area

what angle must sector B have?

(2)



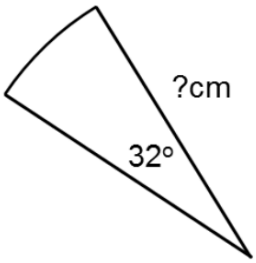
the sector (with a radius of 5cm) is to have an area of $40cm^2$

(a) what angle must the sector have?

what angle do you need for an area of $40cm^2$ for a sector with radius (b) 4cm (c) 6cm ?

(give your answers correct to the nearest 0.1°)

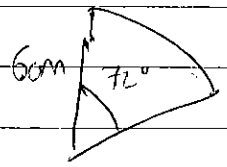
(3)

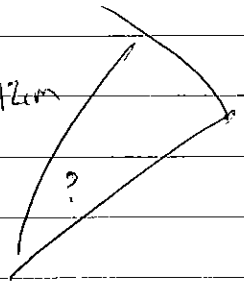


what radius must the sector have so that the area of the sector is $100cm^2$?

(give your answer correct to two decimal places)

area of sectors (ii)





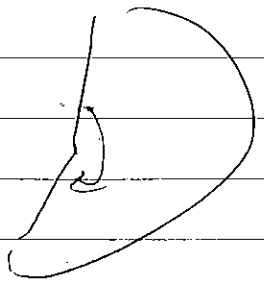
$\frac{72}{360} \times \pi \times 6^2 = \frac{\theta}{360} \times \pi \times 12^2$

$72 \times 6^2 = \theta \times 12^2$

$\frac{72 \times 6^2}{12^2} = \theta = 18^\circ$

1)

(2)



a) $\frac{\theta}{360} \times \pi \times 5^2 = 40$

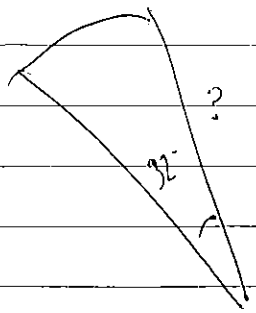
$\theta = 183^\circ$

b) $\frac{\theta}{360} \times \pi \times 4^2 = 40$ $\theta = 286.5^\circ$

c) $\frac{\theta}{360} \times \pi \times 6^2 = 40$ $\theta = 127^\circ$

3)

(3)



$\frac{32}{360} \times \pi \times r^2 = 100$

$r^2 = 358.1$

$r = 18.9\text{ cm}$